31. **Proposed by Professor G. I. HOPKINS, Manchester, New Hampshire.**

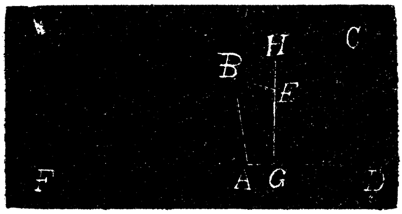
A field is bounded as follows: N. 14° W. 15.2 chains; N. 70° 30′ E. 20.43 chains; S. 6° E. 22.79 chains; N. 86° 30′ W. 18 chains. A spring within it bears from the second corner S. 75° E. 7.9 chains. It is required to cut off 10 acres from the west side of the field by a straight fence through the spring. How far will it be from the first corner to the point at which the division fence meets the fourth side?

Solution by Wm. B. TIMMANS, Professor of Mathematics, St. Mary's College, St. Mary's, Ky.

Let CB and DA be extended to F, and E joined with F.

The bearings give the angles as follows:

$ABF=84^\circ\ 30'$; $BAF=72^\circ\ 30'$; $AFB=23^\circ$; $EBF=145^\circ\ 30'$.



I find $AF=38.722$; $BF=37.101$; and twice area of $ABF=561.34$ sq. ch. In $\triangle$ EBF we have two sides and the included angle; from which I find $EF=43.8411$ ch.; the angle $BFE=5^\circ\ 51'\ 29''$, and the angle $EFG=17^\circ\ 08'\ 31''$.

Let GH be the required line; and call $FH=x$, and $FG=y$.

Hence, we have $xy\sin 23^\circ=561.34+200.=761.34=$twice area GFH....(1).

$43.8411\,x\sin 5^\circ\ 51'\ 29''+43.8411\,y\sin 17^\circ\ 08'\ 31''=761.34=$twice area GFH....(2).

From (1) $xy=\dfrac{761.34}{\sin 23^\circ}=1949.398$, and $x=\dfrac{1949.398}{y}$....(3).

Substituting in (2) and reducing, I get $y^2-58.946\,y=-675.0486$,

$y^2-58.946\,y+(29.473)^2=-675.0486+868.672=193.6234$,

$\therefore\ y-29.473=\pm 13.9148$.

Using the *plus* sign (the *minus* sign cannot be used, as it would make G fall to the *left* of A), we have $y=FG=43.3878$; and $AG=4.6658$. *Ans.*

I find $BH=7.828$; $GH=17.672$; $FGH=83^\circ\ 24'\ 09''$; $FHG=73^\circ\ 35'\ 51''$.

Hence the *ten acre lot* is bounded as follows:

N 14° W.	15.20 ch.
N 70½ E.	7.828
S 3° 05′ 51″ E.	17.672
N 86½ W.	4.6658.

Solutions to this problem were received from *G. B. M. Zerr, William E. Kern, H. C. Whitaker, P. H. Philbrick, J. M. Colaw,* and *A. H. Bell.*

PROBLEMS.

35. **Proposed by LEONARD E. DICKSON, M. A., Fellow in Mathematics, The University of Chicago.**

Determine the equation of lowest degree (cubic) upon which depends the inscription of the regular polygon of 37 sides.